

CLAIMS

1. A semiconductor laser device comprising:

a heat sink; and

a semiconductor laser element,

5 wherein

said heat sink has:

a main cooler unit, formed by joining metal members;

10 a fluid channel, formed inside the main cooler unit and having an inlet and an outlet for a fluid;

15 a cooling region on an outer wall surface of the main cooler unit at which cooling is performed; and

15 a resin layer, being continuously coated onto the outer wall surface and an inner wall surface of the main cooler unit with the exception of the cooling region and preventing the contacting of the metal members and the fluid, and

wherein

said semiconductor laser element is positioned at the cooling region with thermal contact with the outer wall surface being maintained.

20 2. The semiconductor laser device according to Claim 1, wherein the metal members has through holes and grooves, which are continuous with the through holes, as portions of the fluid channel.

25 3. The semiconductor laser device according to Claim 1, wherein the semiconductor laser element is positioned at the cooling region with electrical contact with the outer wall surface being maintained.

4. The semiconductor laser device according to Claim 3, wherein the semiconductor laser element is adhered to the cooling region and to the outer wall surface by a solder.

5 5. The semiconductor laser device according to Claim 1, wherein the resin layer is an epoxy-based resin.

6. A method of manufacturing the semiconductor laser device according to Claim 1, the semiconductor laser device manufacturing method comprising:

10 a member joining step of joining the metal members to form the main cooler unit;

a resin layer coating step of continuously coating the resin layer onto the outer wall surface and the inner wall surface with the exception of the cooling region; and

15 a laser positioning step of positioning the semiconductor laser element at the cooling region with thermal contact with the outer wall surface being maintained.

20 7. The semiconductor laser device manufacturing method according to Claim 6, wherein in the resin layer coating step, the resin is introduced from one end and drawn out from the other end of the fluid channel to coat the inner wall surface with the resin layer.

8. The semiconductor laser device manufacturing method according to Claim 6, further comprising a step of curing the resin layer.

25 9. The semiconductor laser device manufacturing method according to Claim 8, wherein the resin layer is an epoxy-based resin, and when $T1 < T2$, the resin layer is heated at a temperature $T1^{\circ}\text{C}$ and thereafter heated at a temperature $T2^{\circ}\text{C}$ in the curing step.

10. A semiconductor laser device comprising:

a heat sink; and

a semiconductor laser element,

wherein

5 the heat sink has:

a microchannel heat sink;

a fluid channel, formed inside the microchannel heat sink and having an inlet and an outlet for a fluid;

10 a cooling region on an outer wall surface of the microchannel heat sink at which cooling is performed; and

a resin layer, being continuously coated onto the outer wall surface and an inner wall surface of the microchannel heat sink with the exception of the cooling region and preventing the contacting of the microchannel heat sink with the fluid; and

15 the semiconductor laser element is positioned on the cooling region with thermal contact with the outer wall surface being maintained.

11. The semiconductor laser device according to Claim 8, wherein the resin layer is an epoxy-based resin.